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Original Research Article

ABC-VED matrix- a dual approach to efficient inventory control at a tertiary care teaching hospital in India

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ABSTRACT

Background: Inventory control is based on criticality criteria (VED) and on cost criteria (ABC). This underlines the need of strategically planning, creating, and arranging the pharmacy to ensure effective clinical and administrative services.
Methods: This retrospective observational cross-sectional study was conducted in the medical store of Government Medical College, Gondia, Maharashtra, over a one-year period (January-December 2023). A total of 142 drug items were analysed based on complete records of annual consumption and expenditure. ABC, VED, and ABC-VED matrix analyses were performed to categorize drugs. Data were analysed using Microsoft Excel 2019. Ethical clearance was obtained from the institutional ethics committee (approval number: 98/12/11).
Results: Category A drugs (26%) consumed 71.1% of the budget, indicating high expenditure on fewer items. Categories B and C accounted for 32.2% and 40.8% of items, with 22.8% and 6.1% expenditure respectively. VED analysis showed that vital drugs (29.5%) accounted for 24.8% of costs, essential drugs (51.2%) for 47.9%, and desirable drugs (18.3%) for 27.3%. The ABC-VED matrix revealed that category I drugs (47.88%) consumed 90% of the budget, highlighting the importance of monitoring high-cost and life-saving items.
Conclusions: ABC-VED needed to adopt as routine for optimal resource utility eliminates stock out situation in hospital medical store.

Keywords: ABC, Inventory, Matrix, VED

INTRODUCTION

Efficient management of medical inventories in hospitals is critical for ensuring continuous patient care and optimal utilization of resources.[1] In healthcare settings, the inability to maintain adequate stock levels can lead to adverse patient outcomes, while overstocking results in financial wastage and potential expiration of medications. To strike a balance between cost and availability, hospitals often employ inventory management strategies such as the ABC and VED matrix analysis.[2]

The ABC analysis classifies items based on their annual consumption value: category A: high-cost drugs (10%) representing a small portion of items but a large share of expenditure (70%). Category B: moderately priced drugs (20%) with a balanced contribution to (20%) total spending. Category C: low-cost drugs (70%) that account for a minimal portion (10%) of total expenditure. Meanwhile, the VED analysis categorizes drugs based on their criticality to healthcare:

Vital (V) is life-saving drugs that must always be in stock hospital cannot function without them.

Essential (E) drugs necessary for treating common conditions, hospital cannot function without them, but quality is compromised.

Desirable (D) drugs that can be stocked will not hamper hospital function but are not immediately critical.

Combining the ABC and VED matrix approach allows hospital pharmacies to identify which items require strict management and prioritize the most essential and costly medicines.[3] Hence perspective study on ABC-VED analysis was conducted in a tertiary care hospital of India from January to December 2023.

METHODS

This was a retrospective observational cross-sectional study conducted at the medical store of Government Medical College, Gondia, Maharashtra, a tertiary care teaching hospital. The study covered the period from January to December 2023.

The study included all drugs (n=142) that had complete records of annual consumption and expenditure during the study period. Drugs without complete data were excluded.

Data were obtained from the hospital's medical store records. The unit cost of each drug was multiplied by its annual consumption to calculate the total annual drug expenditure (ADE). Drugs were classified using the ABC method based on cost contribution: category A (top 70% of expenditure), category B (next 20%), and category C (remaining 10%). The VED method categorized drugs based on criticality as vital (V), essential (E), or desirable (D). A cross-tabulation of ABC and VED classifications was then used to create an ABC-VED matrix. This matrix divided items into three groups:

Category I (AV, AE, AD, BV, CV): high-cost or life-saving drugs requiring strict control, category II (BE, CE, BD): moderately important drugs requiring routine monitoring, category III (CD): low-priority drugs with minimal control needs.

Ethical approval

Ethical approval was obtained from the institutional ethics committee (IEC number: 98/12/11). Data analysis was primarily descriptive and performed using Microsoft Excel 2019.

RESULTS

The results of the ABC-VED analysis are summarized as follows:

Table 1: ABC analysis.

Category	Drug items	Percentage	Expenditure	Percentage
A	37	26	27,357,102	71.1
B	47	32.2	8,788,124	22.8
C	58	40.8	2,316,469	6.1

Table 2: VED analysis.

Category	Drug Items	Percentage	Expenditure	Percentage
V	42	29.5	9,526,117.2	24.8
E	74	51.2	18,412,311.8	47.9
D	26	18.3	10,523,293	27.3

Table 3: ABC-VED matrix.

Category	Drugs items	Percentage	Expenditure	Percentage
I	68	47.88	3,46,15,549.8	90
II	62	43.78	34,61,554.98	9
III	12	8.34	384,617.22	1

Category A comprising 26% of the total drugs (37 items), accounts for a significant 71.1% of the total expenditure (₹27,357,102). These high-value drugs require close monitoring and stringent control to ensure efficient utilization and avoid overstocking or wastage, given their disproportionate financial impact.

Category B segment consists of 32.2% of the drugs (47 items), contributing 22.8% of the total expenditure (₹8,788,124). Although these drugs do not dominate the budget, they require moderate management oversight to maintain optimal stock levels and avoid unnecessary holding costs or shortages.

Category C category includes 40.8% of the drugs (58 items) but accounts for only 6.1% of the total expenditure (₹2,316,469). These low-cost items represent a smaller financial burden, allowing for simplified inventory control with a focus on availability rather than strict cost management (Table 1).

Vital (V) drugs comprise 29.5% of the drugs (42 items) and 24.8% of the expenditure (₹9,526,117.2). These are lifesaving and must always be available, requiring strict inventory control.

Essential (E) drugs account for 51.2% of the drugs (74 items) and 47.9% of the expenditure (₹18,412,311.8). Critical for routine care, they need regular monitoring to ensure smooth operations.

Desirable (D) drugs make up 18.3% of the drugs (26 items) and 27.3% of the expenditure (₹10,523,293). Though useful, they are less urgent, allowing for flexible management with a focus on cost control (Table 2).

ABC-VED matrix shows that:

Category I- 47.88% of the drugs (68 items) consume 90% of the budget (₹34,615,549.8). These are both high-cost and vital, requiring top-priority stringent management to avoid shortages and check on annual allotted budget.

Category II- 43.78% of the drugs (62 items) use 9% of the budget (₹3,461,554.98). These need moderate supervision to balance availability and budget.

Category III- 8.34% of the drugs (12 items) account for just 1% of spending (₹3,84,617.22). These are low-priority items that need minimal tracking (Table 3).

DISCUSSION

This study found that 51.2% of drugs (category E) were essential and consume 47.9% of ADE. This aligns with studies from PGIMER (2008), where essential drugs accounted for 59.38% of ADE, showcasing the universal necessity of maintaining an adequate stock The ABC-VED matrix is a critical tool for inventory management in healthcare settings, enabling hospitals to prioritize resource allocation efficiently while balancing clinical needs and budgetary constraint.[1]

Critical drugs are category A drugs represent 26% of total drugs but account for 71.1% of annual drug expenditure (ADE). This highlights the financial impact of high-cost drugs requiring stringent monitoring. Similar findings are reported in studies like Kumar et al, where category A drugs consumed over 70% of the total budget.[1]

Essential drugs consist of critical items.[2] Desirable drugs are category C drugs, constituting 40.8% of inventory, account for only 6.1% of expenditure, emphasizing that low-cost drugs need less rigorous management to avoid overstocking. Vital drugs (V) are lifesaving, consuming 24.8% of ADE, while desirable drugs (D) contribute 27.3% of expenditure, where vital drugs formed a major component of hospital costs.

Table 4: Comparative analysis with other studies.

Study	Category A (%) ADE	Category B (%) ADE	Category C (%) ADE	V (%) ADE	E (%) ADE	D (%) ADE
Present study	71.1	22.8	6.1	24.8	47.9	27.3
(2014) AFMC[1]	70	20	10	19	68	13
(2008) PGIMER[2]	68	21	11	12.11	59.38	28.51
2007[3]	70	20	10	7.3	49.3	43.4

CAT- category, %- percentage, V- vital, E- essential, D- desirable, ADE- annual drug expenditure

The ABC-VED matrix analysis consistently shows that high-cost and vital drugs dominate hospital budgets across various studies. This reinforces the universal applicability of the approach in resource-limited settings.

The significant share of essential drugs in the expenditure profile highlights the necessity of maintaining adequate stock for routine patient care.

Comparative findings from AFMC and PGIMER reveal slight variations in the allocation of ADE due to differences in hospital size, specialization, and patient demographics.

The results of our study demonstrate the effectiveness of using the ABC-VED matrix in optimizing drug inventory and cost management. By focusing on high-cost (category A) and critical (vital) drugs, the study ensures adequate availability of lifesaving medicines while minimizing financial wastage.[3,4]

When compared to AFMC 2014 study, these findings align closely with their emphasis on category A drugs consuming 70% of the budget. However, differences in the distribution of essential drugs suggest variations in institutional priorities.[5,6]

Similarly, The PGIMER 2008 study reported slightly higher expenditure on essential drugs (59.38%) compared to our study (47.9%). This may reflect differences in healthcare delivery priorities between PGIMER and this tertiary care hospital.

Our study is comparable to other studies.

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Inventory analysis helps to improve patient care and save expenditure.[10,11] It identifies saving expenditure on obsolete products and provides data informed decision on purchase and procurement.[12,13] ABC-VED analysis provides a systematic approach to drug inventory management by combining cost and criticality classifications.[14] Its implementation helps streamline procurement processes and maintain an optimal balance between availability of essential medicines and budgetary control.[15]

CONCLUSION

The ABC-VED matrix ensures that both high-value and vital items receive appropriate attention, preventing stock-outs without compromising budget efficiency. It allows hospitals to manage their resources strategically by balancing clinical needs with financial constraints. For tertiary care hospitals, where service complexity demands precise planning, the matrix provides a robust framework to ensure that essential supplies are available when needed while avoiding overstocking and wastage. This comprehensive approach enhances both operational efficiency and patient care, making it an indispensable practice for modern healthcare management.

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Ethical approval: The study was approved by the Institutional Ethics Committee IEC no. 98/12/11

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